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CONTENTS:

RESPIRATORY RESPONSES IN THE GRASSHOPPER TO VARIATIONS IN PRESSURE, ... *L. W. Roller.*

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RESPIRATORY RESPONSES IN THE GRASSHOPPER TO VARIATIONS IN PRESSURE.

BY L. W. ROLLER.

From the Physiological Laboratory of the University of Kansas.

With plate XLI.

THE existence of a respiratory center in vertebrates evidently gave rise to the idea of a coordinating center of respiration in insects located in the head. Faivre[1] assumed that the subœsophageal ganglion in *Dytiscus* has a coordinating influence on the respiratory movements, because, when the subœsophageal ganglion, or brain, is destroyed, the respiration is not interrupted, whereas, lesion to the subœsophageal ganglion causes cessation of respiratory movements. Hyde[2] found that after the extirpation of the subœsophageal ganglion in *Limulus* respiration ceased, but when the shock effect had passed off respiratory movements gradually began again, and that the abdominal ganglia are centers for the rhythmical respiratory movements. This fact was also demonstrated by Ewing,[3] who, while working in this laboratory, observed that the abdomen of the grasshopper may be divided into several parts, each of which executes mechanical respiratory movements. These facts prove the erroneousness of Faivre's assertions.

The effects of changes in barometric pressure upon the respiratory movements have been observed upon both lower and higher forms than the grasshopper, none of which, however, had the peculiar properties that make this animal so

1. Faivre: Comptes rendus de l'Academie des Sciences, 1860, vol. LI, p. 38.
2. Hyde, Ida H.: Journal of Morphology, 1894, vol. IX, No. 3, p. 431.
3. Ewing, H. Z.: Kansas University Science Bulletin, 1904, vol. I, No. 2, p. 306.

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valuable for experiments on respiration. Since respiratory movements continue in the grasshopper, even after removal of the viscera and trachea, it is possible to study the effects of pressure acting directly on the nervous system, as well as upon the intact animal.

The apparatus employed for securing high atmospheric pressure consisted of a pressure pump run by a dynamo, and an iron cylinder with tubular connections as illustrated on plate XLI. The cylinder which contained the animals was three feet long and six inches in diameter, painted white inside, and supplied with two valves. One valve was connected through a pressure gauge to the pressure pump, and the other served for the exit of the air. The end lids of the cylinder contained heavy glass windows through which light was reflected into the cylinder. The lids were closed air-tight by iron caps that were secured in place by rivets, and all joints were packed with rubber washers. An open glass tube that contained potassium hydroxide was placed in the cylinder to absorb the carbon dioxide. When studying the effects of low pressure, the grasshoppers were placed in long test-tubes that were connected air-tight to a Sprengle pump that gradually exhausted the contained air.

The material employed in the experiments consisted of different species of both spring and autumn, adult and immature grasshoppers, decapitated, and abdominal parts both with and without the viscera and tracheal tubes. In the latter the nerves were directly exposed to the pressure.

According to Paul Bert,[4] the effect arising from variations in barometric pressure on all living organisms is entirely the result of the tension at which the oxygen is maintained under various atmospheres; and he has called attention to the fact that, at a certain pressure, oxygen is not only not beneficial, but, on the contrary, remarkably toxic. By exposing an animal to four atmospheres of oxygen, for instance, the same effect is produced as that caused by increasing the barometric pressure of the air twenty times. Bert found that in small birds exposed to three and one-half atmospheres of oxygen, that is, seventeen and one-half barometric pressure of air,

4. Bert, Paul E.: Comptes rendus de l'Academie des Sciences, 1873, vol. LXXVI, p. 443.

convulsions appeared in about five minutes, and if exposed to the pressure longer, and then removed to atmospheric pressure, the tetanic spasms continued until death. If the tension was raised at once beyond this, the birds died at once. In a dog, the toxic effect lasted twenty-four hours after it was removed from the high oxygen pressure. He concluded that oxygen, at a certain tension, became toxic to nerve tissue.

According to Verworn,[5] pure oxygen at a pressure of more than three atmospheres, or fifteen atmospheres of air, is fatal to homothermal animals, while, with ordinary air, the same results appear at fifteen to twenty atmospheres. The animals die of asphyxia and convulsions, exactly as when oxygen is deficient and the production of carbonic acid is increased. Muller[6] found that at twenty atmospheres germination and putrefaction are arrested. Smith[7] discovered that, when birds were exposed twenty-four hours to an oxygen tension of 180 per cent., or nine atmospheres of air, the lungs become inflamed and that the time of onset of the inflammation is earlier the higher the tension. Oxygen which, at the tension of the atmosphere, stimulates the lung cells to active absorption, at higher tension acts as an irritant, is toxic, and produces inflammation. He also ascertained that there were two phases of oxygen effects, one consisting in a slowly developing inflammatory state, seen most prominently in the congestion of the lung tissue; the other a rapidly developing effect on the nervous system. A tension of twenty atmospheres, for instance, gives rise to the inflammatory effect in mice in five hours; and in birds, under the same tension, in twelve minutes, to convulsions, due to tetanic effects on the nervous system. This question is of practical importance in connection with caisson and submarine work and the therapeutical use of oxygen.

According to records of men in caissons, engaged in severe work under an oxygen tension of about two atmospheres, often some endure the exposure without severe effect, while in others it has an effect on the lungs. They are occasionally in

5. Verworn: Sitzungsbericht der koniglichen Preussischen Akademie der Wissenschaften zu Berlin, 1896, p. 1243.

6. Muller, W.: Sitzungsbericht der koniglichen Akademie der Wissenschaften, Wien, 1858, Bd. 33, p. 99.

as high as four to five atmospheres of air pressure, and are most liable to dangerous effects while passing from the caissons to the external air. Sudden variations of pressure are far more dangerous than gradual alterations. There is at this time danger of accident due to embolism, by disengagement of the gases within the blood. When the changes of pressure are gradually undergone the intrapulmonary and extrathoracic pressures fall or rise together, and thus the circulatory mechanism remains unaffected. In the *post-mortem* records of cases in which death ensued from the effects of caisson disease, according to Smith, the congestion of the viscera, including the lungs, has been noted, and tends to show that the effects of high oxygen tension are not directly limited to the nervous system, as Bert believed.

In the grasshopper we possess an animal that continues respiratory movements when the structures that are homologous to the lungs of higher forms are removed, so that the effect of the high tension directly on the nervous system can be ascertained. In the grasshopper we have, therefore, most favorable material with which to determine the question whether it is the altered state of the blood, the lowered absorption of the congested lung tissue, the indirect tension through the blood, or direct influence on the nervous system, that produces convulsions in these animals under high atmospheric pressure.

This work was undertaken at the suggestion and under the guidance of Prof. Ida H. Hyde, to whom I am under great obligations for kind and valuable aid.

The Influence on Respiratory Movements in Normal and Decapitated Immature Grasshoppers (Nymphs) Subjected to a High Pressure, that Alternated with Atmospheric Pressure.

Table I gives the average results obtained from these experiments. It was seen that normal and decapitated immature grasshoppers placed under a pressure of about 200 pounds, or thirteen atmospheres, continue their respiratory movements at a reduced rate and force for about three days; after that all movements cease. If the animals are now transferred to

7. Smith, J. Lorain: Journal of Physiology, 1899, vol. XXIV, p. 34.

fresh air and atmospheric pressure for about fourteen hours, the respiratory movements again appear. It was surprising to see that in a few hours the heart was beating forcibly, long before there were any indications of life in any other parts of the body. They had been exposed twenty-four hours to atmospheric air and then were again subjected to 250 pounds pressure, but the respiration now ceased in about eighteen hours, and revived in about half an hour, when removed from the high pressure to that of atmospheric air. For the third time they were exposed to about 250 pounds pressure; the decapitated stopped breathing at once, the normal within twenty-four hours. The latter revived in half an hour in fresh air, and then, for the fourth time, exposed to the high pressure, under which respiratory movements soon ceased and did not return in fresh air.

It had been ascertained that normal grasshoppers can live about four days in the laboratory without food. In these experiments, the grasshoppers lived eight days without food. The respiratory movements continued half of that time under an average tension of 200 pounds, or thirteen atmospheres.

TABLE I.

Time.	Pressure, pounds.	Respiration.	
		Normal.	Decapitated.
Feb. 13, 8:30 A. M..	200	Breathing.	Breathing.
" 14, 8:30 " ..	140	"	"
" 15, 8:30 " ..	100	"	"
" 15, 9:00 " ..	200	"	"
" 16, 9:00 " ..	200	Stopped.	Stopped.
" 16, 5:00 P. M..	Removed to fresh air.	"	"
" 17, 7:30 A. M..	.....	Breathing.	Breathing.
" 17, 2:00 P. M..	250	"	"
" 18, 8:00 A. M..	250	Stopped.	Stopped.
" 18, 9:00 " ..	Removed to air.	"	"
" 19, 9:30 " ..	In air.	Breathing.	Breathing.
" 19, 10:00 " ..	225	"	"
" 19, 4:00 P. M..	275	"	Stopped.
" 20, 10:00 A. M..	250	Stopped.	"
" 20, 11:30 " ..	In fresh air.	"	"
" 21, 9:30 " ..	"	Breathing.	Not revived.
" 21, 11:30 " ..	250	"	Dead.
" 22, 9:00 " ..	250	Stopped.	.....
" 22, 9:10 " ..	In fresh air.	Did not revive.	.....

The Effect of Gradually Increased Pressures.

Normal, decapitated and deviscerated grasshoppers were first subjected to a pressure of 100 pounds. The pressure was daily gradually increased until it reached 275 pounds.

Table II shows the pressure in pounds and time during which the animals were subjected to it.

TABLE II.

TIME.	Pressure, pounds.	Despiration.	
		Normal.	Deviscerated.
March 21, 5:30 P. M..	100	Breathing.	Breathing.
" 22, 3:30 " ..	150	"	"
" 23, 5:30 " ..	200	"	"
" 24, 9:30 A. M..	275	"	Stopped.
" 25, 9:00 " ..	Removed to air; did not recover.	Stopped; did not recover.	Not revived.

In animals that had the viscera and tracheal tubes removed, the respiration continued after an exposure to gradually increased pressure for about sixty hours, while the normal animals breathed about twelve hours longer and did not again revive in fresh air. The animals exhibited no spasms before they were removed from the pressure, and *post-mortems* showed that the viscera and tracheal tubes had been removed.

TABLE III.

TIME.	Pressure, pounds.	Respiration.		
		Normal.	Deviscerated.	Decapitated.
Mar. 14, 5:30 P. M.	275	Breathing.	Breathing.	Breathing.
" 15, 8:30 A. M.	255	"	"	"
" 15, 8:40 "	Taken out to observe.	"	Spasms.	"
" 15, 9:00 "	275	"	"	"
" 16, 5:30 P. M.	Taken out.	Stopped.	Stopped.	Stopped.
" 17, 9:00 A. M.	In air.	Not revived.	Not revived.	Not revived.

Table III shows the mean results of experiments pursued with normal, decapitated and deviscerated immature forms suddenly exposed to about 275 pounds pressure, or fourteen atmospheres. After an exposure for fifteen hours to 275 pounds pressure the animals were removed to that of atmospheric. The deviscerated that had the abdominal nerve cord directly

exposed to the pressure suddenly displayed spasmodic movements of all the appendages; one spasm followed the other in rapid succession. The normal and decapitated did not have spasms, but their respiratory movements were abnormally rapid. They were immediately replaced under 275 pounds pressure and kept there for about twenty-four hours longer. When observed at the end of that time it was noticed that the respiration stopped, and did not return in fresh air and atmospheric pressure.

While the grasshoppers were under the pressure they did not have spasms; they appeared when the animals were very gradually removed from the pressure. It was also noticed that the first effect of the high pressure was an acceleration of the respiratory movements and then the rhythm decreased very much in force and rate.

In another related series of experiments, immature February forms appeared lifeless at the end of twenty-four hours' exposure to 275 pounds pressure, and when removed to atmospheric air fluid escaped from their mouths, while the abdomens in the normal animals became greatly inflated, then gradually assumed their normal dimensions again. During an exposure of two hours to atmospheric pressure the heart and respiratory movements reappeared. The animals were again subjected to 275 pounds tension for about thirty hours, when respiration had ceased and was not again established under atmospheric pressure. November and December forms die in less than two days under a pressure of 275 pounds.

Table IV shows the effect of sudden high pressure on normal and deviscerated mature grasshoppers.

TABLE IV.

Time.	Pressure, pounds.	Respiration.	
		Normal.	Deviscerated.
May 13, 3:15 P. M.	250	Breathing.	Breathing.
" 13, 4:15 "	Taken out to observe.	Sluggish.	Spasms.
" 13, 5:10 "	250	.....	.....
" 14, 8:00 A. M.	Taken out to observe.	No spasms.	Spasms.
" 14, 11:00 "	250	.....	.....
" 14, 5:15 P. M.	Removed.	Moves appendages spasmodically.	Stopped.
" 14, 8:25 "	In air.	.....	Revived with spasms.

It was found that, when the grasshoppers were removed to atmospheric pressure after they had been exposed for one hour to a pressure of 250 pounds, the normal were very sluggish and the deviscerated had severe spasms that lasted almost seven hours. The normal and other deviscerated were now placed for twelve hours under a pressure of 250 pounds, and when removed from the pressure the normal insects displayed spasmodic tetanic movements of the appendages, and the deviscerated had severe spasms. When, during two hours under atmospheric pressure, they had recovered somewhat from the tetanic spasmodic state, they were for a third time subjected to 250 pounds pressure. The normal and deviscerated, when removed from this at the end of six hours, had ceased respiratory and other activity; but the normal revived in one hour, while the deviscerated in three hours under atmospheric pressure, and displayed spasmodic movements of the appendages. Other experiments were pursued with normal and deviscerated mature grasshoppers subjected to a very high pressure for varying periods of time, with the following results: It was ascertained that, when both normal and deviscerated May grasshoppers were removed to atmospheric pressure from ten minutes' exposure to 280 pounds pressure, the deviscerated had slight spasms, the normal not. On the other hand, November grasshoppers did not exhibit spasms when subjected ten minutes or even three-fourths of an hour to the high pressure of 275 pounds, but they all displayed a sluggish, paralyzed condition at the end of that time. An exposure to the pressure for one hour showed that the animals moved their appendages with difficulty, and that after half an hour in atmospheric pressure the deviscerated had spasms, while the intact animals recovered their normal activity.

Effect of Gradually Lowering the Pressure upon Respiratory Movements in the Grasshopper.

The reduced pressure was obtained by means of a Sprengle pump, to which was joined a glass tube containing the grasshoppers. As soon as the pressure fell the animals became restless and moved about in the tube. At first a noticeable expansion of the abdomen occurred, due to decreased

external pressure; but the normal dimensions were again regained when they were subjected some time to a vacuum. The respiratory movements ceased at the end of ten minutes, and in some experiments before the end of six minutes, while the pressure was being gradually decreased and a vacuum not yet attained.

In the last stages of respiratory activity there was a strong launching forward, as if gasping for air, and the appendages assumed a flexed or semiflexed position, in which they remained. The heart was found beating after hours of exposure to a vacuum, though respiration had stopped.

It was seen from this series of experiments that November grasshoppers cease respiratory movements as a vacuum is produced, and that if they are kept in a vacuum seven hours and then exposed to atmospheric air they will recover; but an exposure of eight hours to the vacuum proves fatal.

CONCLUSIONS.

It was believed by Paul Bert and Smith that the injurious effects on lung tissue and the nervous system, due to high tensions of atmospheric pressure, are referable to the toxic influence of oxygen at high pressure, which then acts as an irritant, producing inflammation or pneumonia, and convulsions. Smith showed, furthermore, that if the pressure is gradually raised, the onset of inflammation and convulsions is greatly postponed, and later he proved that it was not alone the toxicity of the oxygen at high tension that was responsible for the pathological conditions, but that the high atmospheric pressure itself was injurious to the lung tissue and nerve-cells. Related to the experiments on the influence of high atmospheric tension is the question of caisson disease. *Post-mortem* records of cases dying from this disease showed congestion of the lungs. The workers are often under a tension of 4 to 5 atmospheres. It has been believed that this disease is produced rather by the sudden change from the high to low pressure, but it is admitted that the risk of accident to workers is proportional to the time of exposure to high pressure.

The results obtained from a study of the influence of

high atmospheric pressure on the respiration in grasshoppers strengthens those obtained by Smith on mammals and birds. He showed that convulsions occurred in birds in three minutes if exposed to oxygen of 280 per cent. of atmospheric pressure or fourteen atmospheres, and in mice in twelve minutes, under an oxygen tension of 400 per cent. atmospheric pressure or twenty atmospheres.

Smith's final experiments led him to conclude that the convulsions were the result of high tension. For testing this question, deviscerated grasshoppers proved ideal material, since most of the trachea and blood were removed, leaving the active respiratory muscles and their centers directly exposed to the pressure.

It was seen from the foregoing experiments that the deviscerated grasshoppers displayed slight convulsions when removed to ordinary atmospheric pressure, often they had been subjected suddenly to a pressure of 280 pounds, or fourteen atmospheres. Moreover, that tetanic convulsions that lasted for several hours appeared if they were kept under that high pressure one hour. Under the same conditions, the normal animals, which had exaggerated respiratory movements when first subjected to the pressure, and later very faint ones, when exposed to ordinary air, gradually increased the sluggish respiratory movements to exaggerated ones, that later became quite normal again. Furthermore, it was shown that the normal and deviscerated both displayed convulsions if kept under this high pressure twelve hours, though they were very gradually removed from high to ordinary pressure. They ceased all respiratory activity that could not be revived if kept under 280 pounds pressure for two days. Moreover, if the pressure was gradually raised to 280 pounds, or fourteen atmospheres, convulsions failed to appear either in the deviscerated or normal grasshoppers kept under these tensions as long as three days, or until they died.

It was interesting to learn that the grasshoppers lived longer —in fact, much longer—than in ordinary air pressure, without food. When high tensions of 200 pounds or ten atmospheres alternated with that of ordinary air, they were in a more or less comatose condition and metabolism was reduced

to a minimum under the high pressure. Moreover, this pressure was not as injurious to the tissue as a pressure of 280 pounds, under which they did not live more than two days, probably because that pressure produced inflammatory conditions in the viscera and tissue corresponding to that of the lungs of higher animals.

It would seem, therefore, that sudden high pressure acting for a few minutes or a few hours, depending upon the maturity of the animals, the time of the year, and the condition of the grasshopper, whether moribund or not, acts as a toxic substance, somewhat like strychnine, directly upon the nervous system, producing convulsions that are of long duration. Moreover, when the pressure acts for one or several days, the tissue of the normal insect is so affected that if it has not died from the changed condition it has severe convulsions when it is removed from the pressure. The spasmodic tetanic movements of the appendages may appear within a few minutes and often after half an hour's exposure to atmospheric pressure and last for several hours. They may entirely recover from the spasms, or the respiratory movements may have ceased when the animals are taken from the pressure machine and some time later again reappear in air. If that is the case the convulsive movements may usher in respiratory activity.

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CONTENTS:

KANSAS APHIDIDÆ, WITH CATALOGUE OF NORTH AMERICAN APHIDIDÆ, AND WITH HOST-PLANT AND PLANT-HOST LIST, PART II,
Charles Emerson Sanborn.

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KANSAS APHIDIDÆ.

WITH CATALOGUE OF NORTH AMERICAN APHIDIDÆ AND HOST-PLANT AND PLANT-HOST LIST, PART II.

BY CHARLES EMERSON SANBORN.

ERRATA TO PART I.

(Vol. III, pp. 1-82.)

Page 8, line 4 from bottom, read *inferior* instead of "superior."

Pages 9 and 10, Color Key and Measure Key are now combined in Blank Key, which is inserted.

Page 13, foot-note 8, omit "genus" and "sp."

Page 14, insert, as line 1, Pulvius probosceus, n. g. and sp.

Page 17, *Hart* instead of "Hartig."

Page 18, *Pemphigus populitransversus* Riley instead of "burrowi."

Page 19, line 9, omit "honey-tubes and style are absent."

Page 27, after "limbs," in next to last paragraph, insert "of apple (Malus malus L.)"

Page 28, after "dogwood," in line 17, insert "(Cornus asperifolia Michx.)

Page 29, line 11, omit "i" in Colophia.

Page 29, *Burmeister* instead of "Bermeister."

Page 33, *Buckton* instead of "Buckston."

Page 34, Chaitophorus. Plate VII, fig. 43, n. sp.

Page 36, for "stevensis n. sp." read *populifolia Fitch.*

Page 37, in line 14, after "gall," omit remainder of sentence.

Page 37, read *new genus* instead of "Chaitophorus," in third line from bottom.

Page 54, under "Aphis brassicæ," line 9, omit remainder of sentence: "Total length," etc.

Page 62, third line from bottom, omit "Koch."

Page 67, third word is *basal;* and instead of "Nectarophora," eighteenth and nineteenth lines, read *Macrosiphum.*

Page 71, tenth line, for "Macrosiphum" read *new genus.*

Page 72, in third line: Mr. Theo. Pergande did not have sufficient material perhaps for identification. Since getting additional notes he thinks it may be a new genus. In line 7, for "anomalous" read *curious.* In line 17, after "could," insert "with exception of honey-tubes."

Page 73, line 3, read *is* instead of "seems to be."

Page 75, line 15, for "female" read *male*. Line 16, read *form* instead of "stem-mother."

Page 81, after first word in last paragraph, read *first segment* instead of "front joints."

Page 82, after first word in last paragraph read "migratory."

Plate II, figure 12, read *Gladobius* instead of "Melanoxanthus."

Plate IV, figures 25 and 26, ventral and dorsal view of Pulvius probosceus, n. g. and sp.

Plate VII, figure 47, read *populifolia* for "stevensis."

Plate XV, for "Macrosiphum" read *new genus*.

Plate XVIII, figure 88, manuscript is lost.

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PLANT-HOST LIST.

Abies nigra Michx.
    Chermes abietis L.
        abieticolens Thos.
    Lachnus abietis Fitch.
Acalypha virginica L.
    Aphis gossypii Glov.
Acer dasycarpum Ehrh. (A. saccharinum L.)
    Aphis quercifoliæ Walsh.
    Drepanosiphum acerfolii Thos.
    Lachnus longistigma Monell.
    Pemphigus acerfolii Riley.
        stamineus Hald.
Acer pennsylvanicum L.
    Chaitophorus aceris L.
Acer platanoides Linn.
    Chaitophorus sp. Felt.
Acer saccarum Marsh.
    Cladobius saliciti Harris.
    Drepanosiphum acerfolii Thos.
    Pemphigus aceris Monell.
Acer sp.
    Cladobius saliciti Harris.
Acerates angustifolia Nutt.
    Aphis asclepiadis Fitch.
Achyrantes sp.
    Myzus achyrantes Monell.
Adianthum pedatum L.
    Aphis adianthi Oestl.

Argrostis plumosa.
    Tetraneura graminis Monell.
Agrostis vulgaris and A. alba L.
    Macrosiphum avenæ F.
Aira cæspitosa L.
    Tetraneura granimis Monell.
Alisma plantago-aquaticca L.
    Rhopalosiphum nymphææ L.
Alnus rubra Bong.
    Pemphigus tessalata Fitch.
Alnus sp.
    Lachnus alnifoliæ Fitch.
    Pemphigus alni Prov.
Alsine media L.
    Aphis gossypii Glov.
Althea sp.
    Aphis cucumeris Forbes.
        malvae Walker.
Amarantus albus L.
    Aphis sp. Weed.
Amarantus hybridus L.
    Aphis maidi-radicis Forbes.
Amarantus retroflexus L.
    Aphis gillettei Cowen.
Amarantus sp.
    Aphis gossypii Glover.
Ambrosia psilostachya DC.
    Macrosiphum ambrosiæ Thos.
Ambrosia trifida L.
    Aphis maidis Fitch.
        middletoni Thos.
Macrosiphum ambrosiæ Thos.
            rudbeckiæ Fitch.
    Tychea erigeronensis Thos.
Amelanchier anifolia Nutt.
    Pemphigus anifoliæ Will.
Ammonia sp.
    Rhopalosiphum dianthi Schr.
Ampelopsis quinquefolia.
    Aphis setariæ Thos.
Andropogon furcatus Muhl.
    Schizoneura corni F.
Apocynum androsæmifolium L.
    Aphis apocyni Koch.
Apocynum cinnabium L.
    Aphis apocyni Koch.
        asclepiadis Fitch.
    Lutescens Monell.
Apocynum sp.
    Aphis asclepiadis Fitch.

Aragallus lamberti Pursh.
    Aphis medicaginis Koch.
Archangelica atropurpurea L.
    Siphocoryne archangelicæ Oestl.
Arctostaphylos uva-ursi L.
    Macrosiphum sp. Cowen.
Artemisia absinthium L.
    Macrosiphum absinthii L.
Artemisia cana Pursh.
    Aphis artemisicola Will.
        canæ Will.
    Macrosiphum artemisicola Will.
Artemisia canadensis Michx.
    Cryptosiphum canadensis Will.
Artemisia frigida Willd.
    Aphis frigidæ Oestl.
    Macrosiphum frigidæ Oestl.
    Cryptosiphum sp.
Artemisia ludoviciana Nutt.
    Cryptosiphum canadensis Will.
    Macrosiphum ludoviciana Oestl.
Artemisia tridentata Nutt.
    Macrosiphum coweni Hunter, W. D.
Artemisia vulgaris L.
    Macrosiphum artemisiæ Thos.
Asclepias syriaca L.
    Aphis asclepiadis Fitch.
        lutescens Monell.
Callipterus asclepiadis Monell.
    Macrosiphum asclepiadis Fitch.
Asclepias incarnata L.
    Aphis lutescens Monell.
Asclepias obtusifolia Michx.
    Callipterus asclepiadis Monell.
Asclepias speciosa Torr.
    Aphis asclepiadis Fitch.
    Macrosiphum asclepiadis Fitch.
Asparagus officinalis L.
    Aphis gossypii Glov.
    Myzus mahaleb Fonsc.
    Rhopalosiphum dianthi Schrank.
Aster sp.
    Aphis middletonii Thos.
Astragulus bisulcatus Hook.
    Aphis medicaginis Koch.
Atriplex hortensis L.
    Aphis rumicis L.
Beet.
    Aphis atriplicis L.
        cucumeris Forbes.
    Macrosiphum pisi Kalt.

Begonia sp.
    Aphis gossypii Glov.
Berberis vulgaris L.
    Rhopalosiphum berberidis Kalt.
Betula papyracera Marsh.
    Callipterus betulæcolens Fitch.
    Hormaphis papyraceæ Oestl.
Betula sp.
    Pemphigus imbricator Fitch.
            tesselata Fitch.
Bidens frondosa L.
    Aphis frondosæ Oestl.
    Rhopalosiphum nymphææ L.
Bidens lævis L.
    Macrosiphum calendula Monell.
            chrysanthemi Oestl.
            rudbeckiæ Fitch.
Brassica arvensis L.
    Aphis brassicæ L.
Brassica oleracæ L.
    Aphis brassica L.
Broccoli.
    Aphis brassicæ L.
Bromus secalinus L.
    Macrosiphum avenæ F.
Broom corn.
    Aphis maidis Fitch.
Brussels sprouts.
    Aphis brassicæ L.
Caladium esculentum.
    Aphis malvæ Walker.
    Rhopalosiphum dianthi Schrank.
Calendula micrantha.
    Aphis calendulicola Monell.
    Macrosiphum calendulicola Monell.
            calendulella Monell.
Calla indica.
    Macrosiphum circumflexa Buckt.
    Rhopalosiphum dianthi Schrank.
Cannabis sativa L.
    Aphis sativa Will.
Capsella bursa-pastoris L.
    Aphis brassicæ L.
        gossypii Glover.
        rumicis L.
    Forda occidentalis Hart.
    Macrosiphum pisi Kalt.
    Schizoneura corni F.
Carnation.
    Phorodon cyanoglossi Will.
    Rhopalosiphum dianthi Schrank.

Caragana arborescens Lam.
    Aphis medicaginis Koch.
Carya alba L.
    Monellia caryella Fitch.
    Phylloxera caryæ Fitch.
        caryæcissa Riley.
        caryæfallax Riley.
        caryæfoliæ Fitch.
        caryæglobuli Walsh.
        caryægummosa Riley.
        caryæsepta Shimer.
        caryævellana Riley.
        caryævenæ Fitch.
        conica Shimer.
        depressa Shimer.
Carya amara Nutt.
    Monellia caryella Fitch.
    Phylloxera caryæcaulis Fitch.
        forcata Shimer.
        minimum Shimer.
        spinosa Shimer.
Carya glabra Will.
    Lachnus caryæ Harris.
    Phylloxera caryæcaulis Fitch.
        caryæglobuli Walsh.
        caryæren Riley.
        caryæsemen Walsh.
        gibbosa Shimer.
Carya olivæformis Nutt.
    Callipterus sp. Monell.
    Phylloxera sp. Riley-Howard.
Carya minima (see C. amara Nutt.)
Carya sp.
    Callipterus caryæ Monell.
    Phylloxera caryæglobosa Shimer.
        depressa Shimer.
        forcata Shimer.
    Schizoneura caryæ Fitch.
Castanea dentata Marsh. (C. sativa americana.)
    Callipterus castanæ Fitch.
    Phylloxera castaneæ Hald.
        sp.
    Catalpa.
    Aphis gossypii Glover.
    Chaitophorus negundinis Thos.
    Phorodon cyanoglossi Will.
Cauliflower.
    Aphis brassicæ L.
Celastrus scandens L.
    Macrosiphum sp. Lint.

Celery.
    Aphis pastinaceæ Koch.
Cephalanthus occidentalis L.
    Aphis cephalanthi Thos.
Cerasus serotina L.
    Aphis cerasicolens Fitch.
        cerasifoliæ Fitch.
Chenopodiaceæ sp.
    Aphis rumicis L.
        atriplicis L.
Chenopodium album L.
    Aphis chenopodii Cowen.
        gossypii Glover.
        rumicis L.
Chenopodium anthelminthicum L.
    Aphis gossypii Glover.
Chenopodium sp.
    Aphis rumicis L.
Cherry.
    Aphis cerasicolens Fitch.
        cerasifoliæ Fitch.
    Myzus cerasi F.
        persicæ Sulz.
Chrysanthemum sp.
    Aphis chrysanthemicola Will.
    Macrosiphum chrysanthemicolens Will.
Cichorium intybus L.
    Tychea erigeronsis Thos.
Cicuta maculata L.
    Macrosiphum sp. Ost.-S.
Circium altissimum Willd.
    Aphis carduella Walsh.
Circium arvenæ Hoffm.
    Macrosiphum rudbeckiæ Fitch.
Circium lanceolatum Hoffm.
    Aphis cardui L.
Citrus aurantium L.
    Aphis gossypii Glov.
    Macrosiphum citrifolii Ashm.
Citrus sp.
    Aphis citri Ashm.
Cnicus sp.
    Aphis cardui L.
        carduella Walsh.
        eneci Will.
    Macrosiphum rudbeckiæ Fitch.
Convolvulus sp.
    Aphis gossypii Glover.
Coreopsis aristosa Michx.
    Aphis coreopsidis Thos.

Corn.
    Aphis maidis Fitch.
        maidi-radicis Forbes.
    Chaitophorus flavus Forbes.
    Forda occidentalis Hart.
    Myzus achyrantes Monell.
    Rhopalosiphum dianthi Schrank.
    Trama erigeronensis Thos.
Cornus amonum Mill.
    Schizoneura corni F.
Cornus asperifolia Michx.
    Schizoneura corni F.
Cornus candidissima Marsh.
    Aphis cornifoliæ Walsh.
        maculata Oestl.
    Schizoneura corni. F.
Cornus florida L.
    Aphis cornifoliæ Fitch.
Cornus mas L.
    Aphis gossypii Glover.
Cornus paniculata (see candidissima).
Cornus sanginea L.
    Schizoneura corni F.
Cornus sericea (see C. amonum Mill.)
Cornus stolanifera Michx.
    Aphis carnifoliæ Walsh.
    Schizoneura corni F.
        cornicola Walsh.
Cornus sp.
    Aphis maculata Oestl.
    Schizoneura corni F.
Corydalis aurea Willd.
    Macrosiphum corydalis Oestl.
Cratægus coccinea L.
    Aphis cratægilfoliæ Fitch.
        marutæ Oestl.
    Macrosiphum cratægi Monell.
Cratægus punctata Jacq.
    Aphis cratægilfoliæ Fitch.
    Schizoneura crataegi Oestl.
Cratægus tomentosus L.
    Aphis cratægilfolæ Fitch.
    Schizoneura cratægi Oestl.
Crocus sp.
    Rhopalosiphum dianthi Schrank.
Cucumis sativus L.
    Aphis cucumeris Forbes.
Cuphea (see Parsonsia).
Currant.
    Myzus ribis L.

Cyanoglossum sp.
    Phorodon cyanoglossi Will.
Cyranthus annuns.
    Rhopalosiphum dianthi Schrank.
Dactylis glomerata.
    Macrosiphum avenæ Fabr.
Datura stramonium L.
    Aphis gossypii Glover.
Deschampsia cæspitosa L.
    Tetraneura graminis Thos.
Desmodium canascens L.
    Macrosiphum desmodi Will.
Diodia teres Walt.
    Aphis gossypii Glover.
Diospyros virginiana L.
    Aphis diospyris Thos.
Elusne indica L.
    Aphis setaria Thos.
    Rhizobius elusinis Thos.
Elymus canadensis L.
    Callipterus (Myzocallis) sp. Oestl.
Epilobium spicatum Lam.
    Macrosiphum sp. Cowen.
Epilobium sp.
    Macrosiphum epilobii Pergande.
Eragrostis pectinacea Michx.
    Schizoneura corni F.
Eragrostis Prushii Schrad.
    Colopha eragrostidis Midd.
Eragrostis frankii Steud.
    Colopha eragrostidis Midd.
Eragrostis major Hast.
    Schizoneura corni F.
Eragrostis sp.
    Schizoneura corni F.
Erigeron altatum.
    Aphis erigeroni Cowen.
Erigeron canadensis L.
    Aphis maidi-radicis Forbes.
        middletoni Thos.
    Macrosiphum erigeronensis Thos.
Erigeron ramosus Nutt.
    Aphis middletoni Thos.
Erigeron umbellatum.
    Aphis erigeroni Cowen.
Euonymus europæus L.
    Aphis rumicis L.
Eupatorium ageratoides L.
    Aphis ageratoides Oestl.
    Macrosiphum eupatoris Will.

Eupatorium perfoliatum L.
    Aphis eupatorii Will.
    Macrosiphum eupatorii Will.
Euphorbia corrollata L.
    Aphis euphorbiæ Kalt.
Euphorbia maculata L.
    Macrosiphum euphorbiæ Thos.
Euphorbia marginata Pursh.
    Macrosiphum euphorbicola Thos.
Euphorbia sp.
    Aphis asclepiadis Fitch.
Fabia vulgaris.
    Aphis cucumeris Forbes.
        rumicis L.
Fagus Americana Sweet. (F. ferruginea.)
    Phyllaphis fagi L.
    Schizoneura imbricator Fitch.
Fragaria indica Andr. (Duchesna.)
    Aphis aparines F.
        gossypii Glover.
    Macrosiphum fragaria Koch.
            var. immaculata Riley.
            minor Forbes.
Fraxinus americanus L.
    Pemphigus fraxinifolii Riley.
Fraxinus nigra Marsh. (F. sambucifoli).
Fraxinus quadrangulata Michx.
    Pemphigus fraxinifolii Riley.
Fungus.
    Schizoneura corni F.
            fungicola Walsh.
Galium aparine L.
    Aphis aparines F.
Galium circæzans Michx.
    Aphis circæzandis Fitch.
Gaura parviflora Doughl.
    Marcrosiphum gaurea Will.
            gaurina Will.
            sp. Cowen.
Genista tinctoria L.
    Aphis rumicis L.
Geranium maculatum L.
    Macrosiphum geranii Oestl.
Geranium cultivated.
    Macrosiphum perlargonii Kalt.
Gerardia tenuifolia Vahl.
    Macrosiphum gerardiæ Thos.
German ivy.
    Rhopalosiphum dianthi Schrank.
Glycyrrhiza lepidota Nutt.
    Aphis medicaginis Koch.

Gossypium herbaceum L.
    Aphis gossypii Glover.
    Rhopalosiphum dianthi Schk.
Grindelia squarrosa Pursh.
    Macrosiphum grindeliæ Will.
    Schizoneura corni F.
Hamamelis virginica L.
    Hormaphis hamamelidis Ost.-S.
        spinosus Shimer.
Helianthus grosse-serratus Mart.
    Aphis helianthi Monell.
Helianthus giganteus L.
    Aphis helianthi Monell.
Helianthus scaberrimus Ell. (H. rigidus.)
    Aphis helianthi Monell.
Helianthus tuberosus L.
    Aphis Helianthi Monell.
Helianthus sp.
    Aphis helianthi Monell.
        gillettei Cowen.
Heuchera hispida Pursh.
    Macrosiphum heucheræ Thos.
Hibiscus cultivated.
    Aphis gossypii Glover.
        malvæ Walker.
    Rhopalosiphum dianthi Schrank.
Hordeum jubatum L.
    Aphis sp. Will.
    Macrosiphum avenæ F.
    Schizoneura corni F.
Humulus lupulus L.
    Aphis gossypii Glover.
    Phorodon humuli Schrank.
Hydrangea sp.
    Aphis gossypii Glover.
Hypericum kalmianum L.
    Callipterus hyperici Monell.
Impatiens aurea Muhl. (I. pallida).
    Macrosiphum carnosa impatiens Will.
Impatiens biflora Walt. (I. fulva).
    Aphis impatiens Thos.
    Macrosiphum camosa impatiens Will.
        fulvæ Oestl.
Iris pumila L.
    Rhopalosiphum dianthi Schrank.
Isatis tintoria L.
    Aphis brassica L.
Japanese lillies.
    Macrosiphum lilii Monell.

Juglans nigra L.
    Calliptenus caryæ Monell.
    Lachnus longistigma Monell.
    Schizoneura caryæ Fitch.
Juncus.
    Rhopalosiphum nymphææ L.
Kale.
    Aphis brassicæ L.
Kohlrabi.
    Aphis brassica L.
Laburnum vulgare Gris.
    Aphis rumicis L.
Lactuca pulchella Dc.
    Macrosiphum erigeronensis Thos.
Lactuca sativa L.
    Macrosiphum lactucæ Kalt.
    Rhizobius lactucæ Kalt.
Lactucæ sp.
    Macrosiphum lactucæ Kalt.
                muralis Buckt.
                rudbeckiæ Fitch.
    Rhopalosiphum dianthi Schrank.
Lappa major Gærtn. (Arctium.)
    Aphis gossypii Glover.
Laris laracina Du Roi.
    Chermes laricifolæ Fitch.
            strobilobus Kalt.
    Lachnus larcifex Fitch.
Lathyrus odoratus L.
    Macrosiphum pisi Kalt.
Leersia virginica Willd.
    Tetraneura graminis Monell.
Lemna minor L.
    Aphis sambuci L.
Lepidium virginicum L.
    Aphis gossypii Glover.
Leptilon canadense (see Erigeron).
Lilium sp.
    Aphis lilicola Will.
    Macrosiphum lilii Monell.
    Rhopalosiphum dianthi Schrank.
Liriodendron tulipifer L.
    Macrosiphum liriodendri Monell.
Lonicera dioica L. (L. glauca Hill).
    Aphis lonicera Monell.
Lonicera parviflora.
    Aphis loniceræ Monell.
        lonicericola Will.
Lonicera sp.
    Aphis loniceræ Monell.

Lycopersicon lycopersicon L.
    Aphis cucumeris Forbes.
    Rhopalosiphum solani Schrank.
Lycopersicon esculentum (see L. lycopersicon).
Malva rotundifolia L.
    Aphis gossypii Glover.
    Myzus achyrantes Monell.
Maruta cotula.
    Aphis marutæ Oestl.
    Myzus achyrantes Monell.
Maurandia hendersoni.
    Rhopalosiphum dianthi Schrank.
Melilotus alba Lam.
    Aphis medicaginis Koch.
Melon.
    Aphis cucumeris Forbes.
        gossypii Glover.
Mentha canadensis L.
    Aphis menthæ-radicis Cowen.
    Macrosiphum menthæ Buckt.
Mentha spicata L.
    Macrosiphum menthæ Buckt.
Mentha viridis see M. spicata L.
Mentzelia nuda Pursh.
    Macrosiphum sp. Cowen.
Mesadenia tuberosa Nutt.
    Macrosiphum rudbeckiæ Fitch.
Mimulus Jamesii T. & G.
    Aphis mimuli Oestl.
Mimulus ringens L.
    Aphis mimuli Oestl.
Mimulus virgens L.
    Aphis mimuli Oestl.
Monarda fistulosa L.
    Aphis monardæ Oestl.
    Phorodon monardæ Will.
        sp. Ost.-S.
Monarda punctata L.
    Aphis monardæ Oestl.
    Phorodon sp. Ost.-S.
Muhlenbergia racemosa Michx.
    Schizoneura corni F.
Mulgedium sp.
    Macrosiphum rudbeckiæ Fitch.
Mustard.
    Aphis brassicæ L.
Nabalus albus L.
    Rhopalosiphum nabali Oestl.
Naias flexilis Will.
    Rhopalosiphum nymphææ L.

Nasturtium annoracia.
    Aphis annoracia Cowen.
Nasturtium sinuatum.
    Pemphigus burrowi n. sp.
Nectarine.
    Myzus persicæ Sulz.
Negundo aceroides Moench.
    Chaitophorus negundinis Thos.
Neilla opulifolia L.
    Aphis neilliæ Oestl.
Nelumbo lutea Willd.
    Rhopalosiphum nymphææ L.
Nepeta glachoma Benth.
    Aphis gossypii Glover.
Nerium oleander L.
    Aphis asclepiadis Fitch.
    Aphis nerii Fonsc.
    Rhopalosiphum dianthi Schrank.
Nicotiana sp.
    Rhopalosiphum dianthi Schrank.
Nymphæa odorata Dry. (Castalia.)
    Rhopalosiphum nymphææ L.
Oats.
    Macrosiphum avenæ F.
    Toxoptera graminum Rond.
Œnothera biennis L.
    Aphis œnotheræ Oestl.
    Macrosiphum sp. Will.
    Myzus œnotheræ Will.
    Pemphigus œnotheræ Will.
Œnothera cæsiptosa Nutt.
    Aphis œnotheræ Oestl.
Œnothera sp.
    Aphis œnotheræ Oestl.
Onoclea strutheopteris L.
    Rhopalosiphum ampullata Buckt.
Opulaster (see Neilla).
Oxytropus (see aragullus).
Ostrya virginiana Mill.
    Macrosiphum gerardiæ Thos.
Oxalis stricta L.
    Aphis maidi-radicis Forbes.
    Rhopalosiphum dianthi Schrank.
Oxybaphus (see Alleonia).
    Panicum crus-carvi.
    Aphis setariæ Thos.
Panicum crus galli L.
    Aphis annuæ Oestl.
        setariæ Thos.
    Geoica squamosa Hart.
    Schizoneura panicola Thos.

Panicum glabrum Gand.
    Schizoneura corni F.
        panicola Thos.
    Thychea panici Thos.
Panicum capillare L.
    Schizoneura corni F.
Panicum proliferum Lam.
    Aphis setariæ Thos.
    Schizoneura corni F.
Panicum sanguinalis L.
    Schizoneura corni F.
Panicum sp.
    Colopha eragrostidis Midd.
Papaver somniferum L.
    Aphis rumicis L.
Parsonsia platycentra.
    Aphis malvae Walker.
Parthenocissa quinquefolia L.
    Aphis parthenocissa Will.
        setariæ Thos.
Pea.
    Macrosiphum pisi. Kalt.
Peach.
    Aphis persicæ-niger Smith.
    Myzus persicæ Sulz.
Phalaris canariensis L.
    Macrosiphum avenæ F.
Phaseolus nanus.
    Aphis gossypii Glover.
Phragmites phragmites L.
    Hyalopteris arundinis Koch.
Picæ sp.
    Chermes abieticolens Thos.
        abietis L.
Pinus australis.
    Lachnus australis Ashm.
Pinus echinata Mill.
    Aphis marginipennis Hald.
Pinus scopulorum Engel.
    Lachnus flocculosa Will.
        pini L.
        ponderosa Will.
Pinus strobus L.
    Chermes pinicorticis Fitch.
    Lachnus rileyi Will.
        strobi Fitch.
    Schizoneura pinicola Thos.
Pinus silvestris L.
    Lachnus pini L.
        rileyi Will

Pinus sp.
    Chaitophorus pinicolens Fitch.
Pisum sativum L.
    Macrosiphum pisi Kalt.
Plantago major L.
    Aphis maidi-radicis Forbes.
        maidis Fitch.
    Myzus plantaginis Pass.
Plantago virginica L.
    Aphis gossypii Glover.
Platanus occidentalis L.
    Aphis quercifoliæ Walsh.
    Lachnus platanicola Riley.
Poa annua L.
    Aphis annuæ Oestl.
    Rhizobius poæ Thos.
    Siphocoryne avenæ F.
Poa compressa L.
    Aphis annuæ Oestl.
    Rhopalosiphum dianthi-poæ Will.
    Siphocoryne avenæ F.
Poa pratensis L.
    Aphis salicola Thos.
    Forda occidentalis Hart.
    Geoica squamosa Hart.
Polanasia graveolens Raf.
    Aphis polanisiæ Oestl.
Polianthes tuberosis L.
    Rhopalosiphum dianthi Schrank.
Polygonum aviculare L.
    Schizoneura corni F.
Polygonum pennsylvanicum L.
    Aphis sp. Will.
Polygonum persicaria L.
    Aphis maidis Fitch.
    Macrosiphum polygoni Walk.
Polygonum Hartwrightii Walk.
    Macrosiphum sp. Ost.-S.
Populus alba L.
    Chaitophorus populi L.
Populus angulorum Cham.
    Chaitophorus populicola Thos.
    Pemphigus populicaulis Fitch.
        pseudobyrsa Walsh.
Populus lævigata angustifolia Bebb.
    Pemphigus populimonilis Riley.
    Chaitophorus populicola Thos.

Populus balsamifera L.
    Pemphigus monilis Riley.
        popularius Fitch.
        populiglobuli Fitch.
        populiramulorum Riley.
        populitransversus Riley.
        populivenæ Fitch.
Populus balsamifera candicans Ait.
    Chaitophorus candicans Thos.
    Pemphigus salicis Linn.
Populus deltoides Marsh (P. monilifera).
    Chaitophorus populicola Thos.
        populifoliæ Fitch.
    Cladobius saliciti Harris.
    Pemphigus populicaulis Fitch.
        populiconduplifolius Cowen.
        populiramulorum Riley.
        populitransversus Riley.
        pseudobyrsa Walsh.
        vagabundus Walsh.
    Phylloxera prolifera Oestl.
Populus dilata Ait.
    Chaitophorus populi L.
Populus granidentata Michx.
    Aphis populifoliæ Fitch.
    Chaitophorus populi L.
        populifoliæ Fitch.
Populus nigra L.
    Chaitophorus populi L.
Populus tremuloides Michx.
    Chaitophorus bruneri Will.
        populi L.
        populicola Thos.
        sp. Ost.-S.
    Pemphigus populicaulis Fitch.
Populus sp.
    Cladobius salicti Harris.
    Pemphigus popularia Fitch.
        vagabundus Walsh.
Portulaca oleracea L.
    Aphis gossypii Glover.
        maidi-radicis Forbes.
Potamogeton sp.
    Rhopalosiphum nymphææ L.
Potato.
    Aphis cucumeris Forbes.
        rumicis L.
    Rhopalosiphum dianthi Schrank.
Potentillatina anserina L.
    Macrosiphum potentillæ Oestl.
    Myzus rosarum Walk.

Potentilla arguta Pursh.
    Mysus potentillæ Will.
Prunus domestica L.
    Aphis pruni Koch.
        prunifolia Fitch.
    Hyalopteris pruni F.
    Myzus cerasi F.
        mahaleb Fonsc.
        persicæ Sulz.
    Phorodon humuli Schrank.
    Rhopalosiphum sp. Lint.
    Schizoneura corni F.
Prunus instititia L.
    Phorodon humuli Schrank.
Prunus serotina Ehrh.
    Aphis cerasicolens Fitch.
Prunus spinosa L.
    Phorodon humuli Schrank.
Prunus virginiana L.
    Aphis cerasifoliæ Fitch.
Prunus sp.
    Hyalopteris arundinis F.
    Macrosiphum prunicola Ashm.
Pseudosuga douglassi Carr.
    Chaitphorus sp.
Pteris aquilina L. (Pteridum).
    Mastopoda pteridis Oestl.
Pyrus americana (see Sorbus).
Pyrus coronaria L. (Malus).
    Schizoneura lanigera Hausm.
Pyrus malus L. (Malus).
    Aphis mali F.
    Callipterus mucidus Fitch.
    Lachnus dentatus Le B.
    Myzus sp. Sanderson.
    Rhopalosiphum serotina Oestl.
    Schizoneura lanigera Hausm.
Quercus alba L.
    Lachnus quercifoliæ Fitch.
    Phylloxera rileyi Licht.
Quercus bicolor, Q. platanoides Lam.
    Callipterus discolor Monell.
        punctata Monell.
    Phylloxera rileyi Licht.
Quercus coccinea Wang.
    Callipterus bellus Walsh.
        sp. Ost.-S.
Quercus imbricaria Michx.
    Callipterus hyalinus Monell.

Quercus macrocarpus Michx.
    Callipterus bellus Walsh.
        discolor Monell.
        punctatus Monell.
    Chaitophorus spinosa Oestl.
    Schizoneura querci Fitch.
Quercus obtusifolia Michx. (Q. minor.)
Quercus phellos L.
    Phyllaphis niger Ashm.
Quercus prinus L.
    Chaitophorus quercicola Monell.
Quercus rubra L.
    Callipterus bellus Walsh.
        quercifolii Thos.
Quercus undulata Torr.
    Schizoneura querci Fitch.
Quercus virginiana Mill. (Q. virens.)
    Lachnus quercicolens Ashm.
Quercus sp.
    Aphis quercicola Walsh.
    Callipterus quercicola Monell.
    Schizoneura querci Fitch.
Radish.
    Aphis brassicæ L.
Raphanus sativus L.
    Aphis sp. Cowen.
Raphinus lanceolata.
    Aphis frangulæ Kalt.
Rhus glabra L.
    Pemphigus rhois Fitch.
    Rhopalosiphum rhois Monell.
Ribes aureum Pursh.
    Myzus ribes L.
Ribes cynosbati L.
    Macrosiphum cynosbati Oestl.
Ribes rotundifolium Michx.
    Macrosiphum sp. Will.
    Myzus ribis L.
Ribes viscossisium Pursh.
    Myzus ribis L.
Robina pseudacacia L.
    Rhopalosiphum dianthi Schrank.
Robina viscosa Vent.
    Aphis medicaginis Koch.
Rose.
    Macrosiphum pallida Oestl.
        rosæ florida Ashm.
    Myzus rosarum Walker.
Rubus occidentalis L.
    Pemphigus rubi Thos.

Rubus strigosus Michx.
    Aphis rubicola Oestl.
    Nectarosiphon rubicola Oestl.
Rubus villosus Ait.
    Macrosiphum rubi Kalt.
    Sipha rubifolii Thos.
Rudbeckiæ lacinata L.
    Macrosiphum rudbeckiæ Fitch.
Rumex acetosa L.
    Aphis rumicis L.
Rumex altissimus Wood.
    Aphis atriplicis L.
        maidis Fitch.
        rumicis L.
Rumex crispus L.
    Aphis gossypii Glover.
        maidi-radicis Forbes.
        rumicis L.
Rumex lapathum.
    Aphis rumicis L.
Rumex venosus Pursh.
    Aphis rumicis L.
Rumex sp.
    Aphis rumicis L.
Ruta Baga L.
    Aphis brassica L.
Sagittaria latifolia Wild. (S. varabilis Eng.)
    Rhopalosiphum nymphææ L.
Salix alba L.
    Chaitophorus viminalis Monell.
    Cladobius salicis L.
        smithiæ Monell.
Salix amygdaloides Anders.
    Aphis salicola Thos.
Salix babylonica L.
    Chaitophorus viminalis Monell.
    Siphocoryne salicis Monell.
Salix discolor Muhl.
    Aphis salicola Thos.
Salix interior Rowl. (S. longifolia M.)
    Chaitophorus nigræ Oestl.
        sp. Ost.-S.
    Cladobius salicis Monell.
Salix lucida Muhl.
    Chaitophorus viminalis Monell.
    Cladobius salicis L.
    Siphocoryne salicis Monell.
Salix nigra Marsh.
    Chaitophorus nigræ Oestl.
    Siphocoryne salicis Monell.

Salix viminalis L.
    Cladobius salicis L.
Salix sp.
    Aphis salicicola Thos.
    Callipterus viminalis Monell.
    Chaitophorus cordata Will.
                salicis Will.
                salicte Schrank.
    Cladobius bicolor Oestl.
            flocculosus Weed.
            salicis L.
            saliciti Harris.
            sp. Ost.-S.
    Lachnus dentatus Le B.
            salicellis Fitch.
            viminalis Fonsc.
Sambucus canadensis L.
    Aphis sambucifolii Fitch.
Saniculata canadensis L.
    Aphis saniculæ Will.
Sarothamus scoparius.
    Macrosiphum menthæ Buckt.
Scropularia nodosa L.
    Macrosiphum sp. Ost.-S.
    Phorodon scropulariæ Thos.
Senapis nigra Koch. (Brassica.)
    Aphis brassicæ L.
Senechio canus Hook.
    Aphis senichionis Will.
Senechio cineraria DC.
    Macrosiphum circumflexa Buckt.
Senechio lugens Rich.
    Aphis lugentis Will.
Setaria italica germanica ochloa Mill.
    Aphis maidi-radicis Forbes.
    Schizoneura corni F.
Setaria glauca L. (Chætochloa.)
    Aphis maidis Fitch.
        setariæ Thos.
    Schizoneura corni F.
Setariæ viridis L. (Chætochloa.)
    Aphis maidis Fitch.
    Schizoneura corni F.
Silphium perfoliatum L.
    Macrosiphum rudbeckiæ Fitch.
Smilax herbacea L.
    Lachnus smilacis Will.
Smilax rotundifoliæ L.
    Pemphigus attenuatus Ost.-S.
Smilax sp.
    Pemphigus vagabundus Walsh.

Solanum jasminoides Paxt.
    Macrosiphum solanifolii Ashm.
Solidago canadensis L.
    Aphis solidaginifoliæ Ashm.
    Macrosiphum solidaginis Fabr.
Solidago missouriensis Nutt.
    Macrosiphum luteola Will.
Solidago rigidii L.
    Macrosiphum rudbeckiæ Fitch.
    Rhopalosiphum serotinæ Oestl.
Solidago serotina Ait.
    Aphis middletonii Thos.
    Macrosiphum rudbeckiæ Fitch.
                solidaginis F.
    Rhopalosiphum serotinæ Oestl.
Sonchus dianthi Schrank.
    Rhopalosiphum dianthi Schrank.
Sonchus oleraceus L.
    Macrosiphum rudbeckiæ Fitch.
                sonchella Monell.
                sonchi L.
    Rhopalosiphum dianthi Schrank.
Sorbus americana Marsh.
    Aphis mali F.
Sorghum halpense L.
    Aphis maidis Fitch.
    Chaitophorus flavus Forbes.
Spartini cynosuroides Willd.
    Schizoneura corni F.
Spinacia oleracea Will.
    Aphis gossypii Glover.
Spiraxis sp.
    Macrosiphum circumflexa Buckt.
Spirla ulmaria L. (Ulmaria.)
    Macrosiphum pisi Kalt.
Spruce.
    Chermaphis abietis L.
Squash.
    Aphis cucumeris Forbes.
    Macrosiphum cucurbitæ Thos.
Stellaria media L. (Alsine.)
    Aphis gossypii Glover.
Sugar-beet.
    Aphis atriplicis L.
            gossypii Glover.
            middletonii Thos.
            sp. Hart.
    Macrosiphum erigeronensis Thos.
                pisi Kalt.
    Myzus achyrantes Monell.
    Pemphigus betæ Doane.

Symphoricarpus occidentalis Hook.
    Aphis albipes Oestl.
        symphoricarpi Thos.
Symphoricarpus pauciflorus Robb.
    Aphis albipes Oestl.
        symphoricarpi Thos.
Symphoricarpus symphoricarpus L. (S. vulgaris M.)
    Aphis albipes Oestl.
        symphoricarpi Thos.
Synosma suaveolens L.
    Macrosiphum rudbeckiæ Fitch.
Tenacetum vulgars L.
    Macrosiphum tanaceti Linn.
Tares.
    Macrosiphum pisi Kalt.
Taraxacum dens-leonis (T. officinale Web.)
    Aphis gossypii Glover.
Thalesia sp.
    Aphis middletoni Thos.
Thalictrum purpurascens L.
    Macrosiphum purpurascens Oestl.
            thalicti Oestl.
    Myzus thalicti Will.
Thaspium aureum Nutt.
    Aphis thaspii Oestl.
Thaspis bursa-pastoris (capsella).
    Aphis rumicis L.
Tillia americana L.
    Drepanosiphum tiliæ Koch.
    Lachnus longistigma Monell.
    Macrosiphum tiliæ Monell.
Tilia europea L.
    Lachnus longistigma Monell.
Timothy.
    Geoica squamosa Hart.
Tobacco.
    Macrosiphum tobaci Pergande.
Townsendia excapa Rich. (T. sericea H.)
    Rhopalosiphum dianthi Schrank.
Trifolium pratense L.
    Aphis bakeri Cowen.
        gossypii Glover.
        trifolii Oestl.
    Callipterus trifolii Monell.
    Macrosiphum sp. Ost.-S.
Trifolium repens L.
    Aphis cephalicola Cowen.
        trifolii Oestl.
    Macrosiphum pisi Kalt.

Trifolium sp.
    Callipterus trifolii Monell.
    Geoica squamosa Hart.
    Macrosiphum pisi Kalt.
Tulipa gesneriana L.
    Macrosiphum tulipæ Thos.
    Rhopalosiphum dianthi Schrank.
                tulipæ Thos.
Tulipa.
    Macrosiphum tulipæ Thos.
Typha latifolia L.
    Rhopalosiphum dianthi Schrank.
Ulmaria ulmaria L.
    Macrosiphum pisi Kalt.
Ulmus americana L.
    Callipterus ulmifolii Monell.
    Colopha ulmicola Fitch.
    Pemphigus walshi Will.
    Tetraneura ulmi De G.
    Schizoneura americana Riley.
Ulmus pubescens Walt. (U. fulva).
    Pemphigus ulmi-fusus Walsh.
Ulmus racemosa Thos.
    Colopha ulmicola Fitch.
    Ulmus rubra (U. fulva Michx).
    Callipterus bella Walsh.
    Chaitophorus quercifoliæ Thos.
Ulmus suberosus.
    Tetraneura ulmi De G.
Ulmus sp.
    Lachnus ulmi L.
Urtica dioica Pursh.
    Macrosiphum pisi Kalt.
Urtica gracilis Ait.
    Macrosiphum pisi Kalt.
Valeriana edulis Nutt.
    Aphis valerinæ Cowen.
Veratrum californicum Durand.
    Aphis veratri Cowen.
Verbena sp.
    Macrosiphum verbenæ Thos.
Vernonia fusciculata Michx.
    Aphis middletoni Thos.
            vernoniæ Thos.
    Macrosiphum rudbeckiæ Fitch.
Vernonia lindheimeriana Eng. & Gray.
    Macrosiphum rubeckiæ Fitch.
Vernonia novæboracensis L.
    Macrosiphum rudbeckiæ Fitch.
Vernonia sp.
    Aphis middletoni Thos.

Vicia cracca L.
    Aphis rumicis L.
Vicia gigantea Hook.
    Macrosiphum pisi Kalt.
Vicia ludoviciana Nutt.
    Macrosiphum pisi Kalt.
Vicia villosa.
    Macrosiphum pisi Kalt.
Vicia sp.
    Macrosiphum pisi Kalt.
Violet.
    Rhopalosiphum violæ Pergande.
Viburnum opulus L.
    Aphis rumicis L.
        viburni Scop.
Vitis riparia Michx.
    Aphis ripariæ Oestl.
Vitis cordifolia Michx.
    Aphis ripariæ Oestl.
    Macrosiphum viticola Thos.
    Phylloxera vastatrix Planch.
Vitis sp.
    Aphis vitis Scop.
    Macrosiphum viticola Thos.
    Phylloxera vastatrix Planch.
Wahoo (Euonymus atropurpureus Jacq).
    Aphis rumicis L.
Wheat.
    Aphis mali F.
    Callipterus ulmifolii Will.
        sp. Will.
    Megoura sp. Will.
    Rhopalosiphum sp. Will.
    Siphocoryne avenæ F.
    Toxares sp. Will.
    Toxoptera graminum Rond.
Xanthium canadense Will.
    Siphocoryne xanthi Oestl.
Yucca glauca Nutt. (Y. angustifolia Pursh.)
    Aphis yuccæ Cowen.

CATALOGUE OF NORTH AMERICAN APHIDIDÆ AND HOST-PLANT LIST.

Genus APHIS.

aceriodes Raf.
adianthi Oestl.
Adianthum pedatum L.
ageratoidis Oestl.
Eupatorium ageratoides L.
albipes Oestl.
Symphoricarpos pauciflorus Robb.
symphoricarpus L.
vulgaris M.
occidentalis Hook.
ambrosia Raf.
amidis F.
Corn.
annuæ Oestl.
Panicum crus-galli L.
Poa annua L.
Poa compressa L.
annulipes Raf.
Hieracium gronovia.
paniculatum.
aparines F.
Fragaria idica Andr. (Duchesna.)
Galium aparine L.
apocyni Koch.
Apocynum androsamifolium L.
cinnabium L.
aquilega canadensis Raf.
arabia-hispida Raf.
arabis-mollis Raf.
armoraciæ Cowen.
Apocynum sp.
Euphorbium sp.
Nasturtium armoracia Gray.
asclepiadis Fitch.
Acerates angustifolia Nutt.
Apocynum cinnabium L.
sp.
Asclepias syriaca.
Asclepias speciosa Torr.
cornutum.
atriplicis L.
Chenopodiaceæ sp.
hybridum.
Rumex altissimus Wood.

Genus APHIS.

atriplicis L.
Sugar-beet.
bakeri Cowen.
Trifolium pratense L.
bicolor Hald.
brassicæ L.
Brassica oleraceæ L.
arvensis L.
Broccoli.
Brussels sprouts.
Cauliflower.
Capsella bursa-pastoris L.
Isatis tintoria L.
Kale.
Kohl rabbi.
Mustard.
Radish.
Raphnus sativus.
Rutabaga.
Senapis nigra.
alba.
calendulicola Monell.
Calendula micrantha.
campanula Raf.
candicans F.
carduella Walsh.
Circium altissimum Willd.
Cnicus sp.
cardui L.
Circium lanceolatum Hoffm.
Cnicus sp.
castanea-vesca Hald.
cephalanthi Thos.
Cephalantaus occidentalis L.
cephalicola Cowen.
Trifolium repens L.
cerasicolens Fitch.
Cerasus serotina L.
Prunus serotina Ehrh.
cerasifoliæ Fitch.
Cerasus serotina L.
Prunus virginiana L.
chenopodii Cowen.
Chenopodium album L.
circæzandis Fitch.
Galium circæzans Michx.
citri Ashm.
Citrus sp.

Genus APHIS.
coreopsidis Thos.
Coreopsis aristosa Michx.
cornifoliæ Walsh.
Cornus candidissima Marsh.
florida L.
stolonifera Michx.
cratægifoliæ Fitch.
Cratægus coccinea L.
punctata Jacq.
tomentosus L.
cratægus coccinea Raf.
diervilla-lutea Raf.
dilepha Raf.
diospyris Thos.
Diosporos virginiana L.
discolor Hald.
erigeron canadense Raf.
erigeroni Cowen.
Erigeron umbellatum.
alatum.
erigeron philadelpheum Raf.
erigeron strigosum Raf.
euonymi Fabr.
Euonymus atropurpureus.
eupatorii Oestl.
Eupatorium perfoliatum L.
euphorbiæ Kalt.
Euphoribia corollata L.
forbesi Weed.
frangulæ Kalt.
Raphnus lanceolata Pursh.
frigidæ Oestl.
Artemisia frigida Willd.
frondosa Oestl.
Bidens frondosa.
furcipes Raf.
Primula veris.
Ballis peremnis.
fusciclava Raf.
Many garden plants.
gibbosa Raf.
Solidago.
gilletti Cowen.
Amarantus retroflexus L.
Helianthus sp.
gossypii Glover.
Acalypha virginica.
Alsine media L.
Amarantus sp.
Arctium lappa.

Genus APHIS.

gossypii Glover.

Asclepiadora decumbens Gray.
Asparagus officinalis L.
Begonia.
Callirrhoe involucrata Gray.
Capsella bursa-pastoris.
Catalpa catalpa L.
Chenopodium album L.
Chenopodium anthelminthicum L.
Citrus aurantium L.
Citrullus citrullus Small.
Convolvulus sp.
Cornus mas.
Cucumus melo L.
Datura stramonium L.
Diodia teres Walt.
Fragaria indica.
Fragaria, cultivated.
Gossypium herbaceum L.
Hibiscus sp.
esculentus L.
Humulus lupulus.
Hydrangea.
Lagenaria lagenaria L.
Lappa major Gærtn.
Lepidium virginicum L.
Malva rotundifolia L.
Nepeta glachoma Benth.
Œnothera biennis L.
Ontogonia, in greenhouse.
Paspalum.
Phaseolus nanus.
Plantago virginica L.
Portulaca oleracea L.
Pyrus communis.
Quercus stellata Wang.
Rumex crispus L.
altissimus.
Scutellaria wrightii Gray.
Spinacea oleracea Will.
Stellaria media.
Sugar beet.
Taraxacum dens-leonis.
officinalis Webb.
Trifolium pratense.
Vidnis sinensis L.

helianthi Monell.

Helianthus grosse-serratus Mart.
giganteus L.
scaberrimus Ell.

Genus APHIS.
helianthi Monell.
Helianthus grosse-serratus Mart.
tuberosus L.
annus.
rigidus.
sp.
heracli Cowen.
Heracleum lanatum.
hieracium paniculatum Raf.
hieracium venosum Raf.
hyperici Monell.
Hypericum kalminium.
illinoiensis Shimer.
Grape.
impatiens Thos.
Impatiens biflora Walt.
fulva Walt.
pallida.
loniceræ Monell.
Lonicera dioca L.
glauca Hill.
parviflora.
sp.
jacobea balsamita Raf.
loniceræ Monell.
lutescens Monell.
Apocynum cinnabium L.
Asclepias incarnata L.
syriaca L.
maculata Oestl.
Cornus candidissima Marsh.
paniculata L.
sp.
maidi-radicis Forbes.
Amarantus hybridus L.
Corn.
Erigeron canadensia L.
Oxalis stricta L.
Plantago major L.
Portulaca oleraceæ L.
Rumex crispus L.
Setaria italica germanica ochloa Mill.
maidis Fitch.
Kaffir corns.
Setaria glauca.
Sorghums cultivated.
Sorghum halpense.
Zea mays.
marutæ Oestl.
Maruta cotula and Cratægus.

Genus APHIS.

medicaginis Koch.
Argallus lamberti Pursh.
Astragulus bisulcatus Hook.
Caragana arborescens Lam.
Glycyrrhiza lepidota Nutt.
Melilotus alba Lam.
Robina viscosa.

middletoni Thos.
Ambrosia trifida L.
Aster sp.
Erigeron canadensis L.
ramosus Nutt.
Solidago serotina.
Sugar-beet.
Thalesia sp.
Vernonia fusciculata Michx.
sp.

mimuli Oestl.
Mimulus jamesii T. & G.
ringens L.
virgens L.

monardæ Oestl.
monarda fistulosa L.
punctata L.

neilliæ Oestl.
Neilla opulifolia L.

nerii Fonsc.
Nerium oleander L.
Asclepias.

onotheræ Oestl.
Onothera biennis L.
cæspitosa Nutt.
serrulata.

oreaster Raf.
Highland asters.

oxybaphi Oestl.
Oxybaphus angustifolius.
nyctagineus.

pastinaceæ Koch.
Celery.

persicæ-niger E. F. Smith.
Peach, cultivated.

pilosa Hald.
Exotic species of willow.

polanisiæ Oestl.
Polanisia graveolens.

polygala-senaga Raf.
Polygala senaga.

populifolia Fitch.
Populus granididentata Michx.

Genus APHIS.
- populus trepida Raf.
  - Populus trepida.
- prunicola Kalt.
  - Plum, cultivated.
- prunicolens Ashm.
  - Prunus.
  - Chenapodium album L.
    - hybridum.
  - Euonymus atropurpurus Jacq.
    - europæns L.
  - Fabia vulgaris.
  - Genista tinctoria.
  - Laburnum vulgare Gris.
  - Papaver somniferum L.
  - Potato, cultivated.
  - Rumex altissimus Wood.
    - crispus L.
    - lapathum.
    - acetosa L.
    - venosus Pursh.
    - sp.
  - Viburnum opulis L.
- salicola Thos.
  - Poa pratensis L.
  - Salix amygdaloides Anders.
    - discolor Muhl.
    - sp.
- sambuci L.
  - Lemna minor L.
  - Sambucus racemosa.
- sambucifoliæ Fitch.
  - Sambucus canadensis.
- setariæ Thos.
  - Panicum proliferum Lam.
    - carvi.
    - crus-galli, on roots, L.
  - Parthenocissus quinquefolia L.
  - Setaria glauca L.
  - Setaria viridis.
- solidaginifoliæ Ashm.
  - Solidago canadensis L.
- spiraæ Oestl.
  - Spirea salicifolia.
- prunifoliæ Fitch.
  - Plum, cultivated.
- pteris-aquilinoides Raf.
  - Pteris aquilina L.
- quercicola Walsh.
  - Quercus sp.

Genus APHIS.

quercifoliæ Walsh.
Acer dasycarpum.
Quercus sp.
Platanus occidentalis L.
quercus-monticulei Hall.
rhodryas Raf.
Wild rose.
ripariæ Oestl.
Vitis cordifolia Michx.
riparia Michx.
rosa-suaveolens Raf.
rubecula Hald.
rubicola Oestl.
Rubus strigosus Michx.
rumicis L.
Atriplex hortensis L.
Bean, cultivated.
Bursa pastoris.
symphoricarpi Thos.
Symphoricarpus racemosus var. pauciflorus Rolh.
occidentalis Hook.
vulgaris.
thaspii Oestl.
Thaspium aureum Nutt.
trifolii Oestl.
Trifolium pratense L.
repens, on roots, L.
tritici Fitch.
valerinæ Cowen.
Valneriana edulis Nutt.
veratri Cowen.
Veratrum californicum Durard.
verbena-hastata Raf.
vernoniæ Thos.
Vernonia fasiculata Michx.
verticolor Raf.
Several species of Glossanthia.
Hieracium venosum.
viburnum acerifolium Raf.
Virburnum acerifolium.
virburnum-opulus Raf.
Viburnum opulus.
vitis Scop.
Grape, cultivated.
xantholis Raf.
Solidago memoralis.
yucca Cowen.
Yucca glanca Nutt.
angustifolia Pursh.

Genus CALLIPTERUS.
asclepiadis Monell.
Asclepias syiaca L.
obtusifolis Michx.
cornutum.
bellus Walsh.
Quercus rubra L.
macrocarpa Michx.
coccinea Wang.
betulæcolens Fitch.
Betula papyracea Marsh.
caryæ Monell.
Carya sp.
Juglans nigra L.
Carya olivæformis.
castaneæ Fitch.
castanea vesca.
dentata Marsh.
Sativa americana.
discolor Monell.
Quercus macrocarpa Michx.
bicolor Lam.
hyalinus Monell.
Quercus imbricaria Michx.
hyperici Monell.
Hypericum prolificum L.
kalmianum.
mucidus Fitch.
Pyrus malus L.
punctatus Monell.
Quercus bicolor.
macrocarpus Michx.
quercicola Monell.
Quercus sp.
quercifollii Thos.
Quercus rubra.
trifolii Monell.
Trifolium pratense L.
sp.
ulmifolli Monell.
Ulmus americana L.
callipterus sp.
Quercus macrocarpa.
coccinea.
Carya olivæformis Nutt.
Genus CHAITOPHORUS Koch.
aceris L.
Acer pennsylvanicum L.
candicans Thos.
Populus balsamifera candidans.

Genus CHAITOPHORUS Koch.
- flavus Forbes.
  - Corn, cultivated.
  - Sorghum, cultivated.
    - halpense L.
  - Zea mays.
- negundinis Thos.
  - Negundo asceroides Moench.
  - Catalpa catalpa L.
- nigræ Oestl.
  - Salix nigra Marsh.
    - interior Rowl.
    - longifolia M.
- pinicolens Fitch.
  - Pinus sp.
- populi Linn.
  - Populus alba L.
    - angulorun Cham.
    - granidentia Michx.
    - nigra L.
    - tremuloides.
    - dilata.
    - deltoides Marsh.
- populicola Thos.
  - Populus monilifera.
    - angulata.
    - tremuloides Michx.
    - angustifolia.
    - lævigata angustifolia Bebb.
    - granidentia Michx.
- populifoliæ Fitch.
  - Quercus rubra.
  - Populus granidentia.
    - monilifera.
- quercicola Monell.
  - Quercus prinus L.
- quercifolia Thos.
  - Quercus rubra.
  - Ulmus rubra L.
- salicite Schrank.
  - Salix sp.
- spinosus Oestl.
  - Quercus macrocarpa Michx.
- viminalis Monell.
  - Salix alba L.
    - babilonica D.
  - Salix sp.

Genus CHERMAPHIS.
- abieticolens Thos.
  - Abies nigra Michx.
  - Picea sp.

Genus CHERMAPHIS.
- abietis Linn.
  - Abies nigra Michx.
  - Picea sp.
- castanea Hald.
  - Castanea sp.
- laricifoliæ Fitch.
  - Larix americana Du Roi.
    - laricana Du Roi.
- pinicorticis Fitch.
  - Pinus strobus L.
- strobilobius Kalt.
  - Larix americana Du Roi.

Genus CLADOBIUS Koch.
- bicolor Oestl.
  - Salix sp.
- flocculosus Weed.
  - Salix sp.
- populeus Kalt.
  - (Host unknown.)
- salicis Linn.
  - Salix alba.
    - longifolia.
    - lucida.
    - viminalis.
    - sp.
  - Populus balsamifera candicans.
- salicti Harris.
  - Acer sp.
  - Populus sp.
    - monilifera.
  - Salix sp.
- smithiæ Monell.
  - Salix alba.
- sp.
  - Salix sp.

Genus COLOPHA Monell.
- eragrostidis Middleton.
  - Panicum sp.
  - Eragrostidis pœaoides megastachya.
    - franheulin.
    - purshii.
    - frankii.
- ulmicola Fitch.
  - Ulmus americana and racemosa.

Genus DREPANOSIPHUM Koch.
- acerfolii Thos.
  - Acer dasycarpum.
    - saccharium.

Genus DREPANOSIPHUM Koch.
tiliæ Koch.
Acer saccharium.
Tilia americana.

Genus HORMAPHIS.
cornu Shimer.
Hamamelis virginiana.
hamamelidis Osten-Sacken.
Hamamelis virginica.
papyraceæ Oestl.
Betula papyraceæ.
spinosus Shimer.
Betula papyraceæ.
Hamamelis virginica.

Genus HYALOPTERIS.
arundinis Fabr.
Phragmantis communis.

Genus LACHNUS.
abietis Fitch.
Abies nigra and alba.
alnifolia Fitch.
Alnus rubra.
australis Ashm.
Pinus australis.
caryæ Harris.
Carya porcina.
dentatus Le Baron.
Salix sp.
laricificex Fitch.
Larix americana.
longistigma Monell.
Tillia americana.
europæa.
Populus balsamifera.
Carya amara.
Acer dasycarpum.
Cercis canadensis.
Platanus occidentalis.
Juglans nigra.
Quercus marylandica.
rubra.
pini Linn.
Pinus sylvestris.
ponderosa scopulorum.
platanicola Riley.
Platanus occidentalis.
querciolens Ashm.
Quercus virens.
quercifolia Fitch.
Quercus alba.

Genus LACHNUS.
- salicellis Fitch.
  - Salix sp.
- strobi Fitch.
  - Pinus strobus.
- ulmi Linn.
  - Ulmus sp.
- viminalis Fonsc.
  - Salix sp.

Genus MACROSIPHUM.
- absinthii L.
  - Artemisia absinthium L.
- ambrosia Thos.
  - Ambrosia trifida.
    - psilostachya.
- artemisia Koch.
  - Artemisia vulgaris.
- asclepiadis Fitch.
  - Asclepias cornuta.
- asclepiadis Cowen.
  - Asclepias speciosa.
- avenæ Fabr.
  - Wheat.
  - Agrostis vulgaris.
  - Bromus secalinus.
  - Dactylis glomerata.
  - Poa pratensis.
- callenduella Monell.
  - Calendula micrantha.
  - Bidens chrysanthemoides.
- caudata Pergande.
  - (Host unknown.)
- chrysanthemi Oestl.
  - Bidens chrysanthemoides.
- circumflexa Buckt.
  - Senechio cineraria.
  - Spiraxis sp.
- corydalis Oestl.
  - Corydalis aurea.
- cowenii n. n. Hunter, W. D.
  - Artemisia tridentata.
- cratægi Monell.
  - Cratægus coccinea.
- cucurbitæ Thos.
  - Egg-plant.
  - Squash.
- cynosbati Oestl.
  - Ribes cynosbati.
- epilobii Pergande.
  - Epilobium sp.

Genus MACROSIPHUM.

erigeronensis Thos.
Erigeron canadense.
Lactuca pulchella.
Sugar-beet.
euphorbicola Thos.
Euphorbia hypericifolia.
fragariæ immaculata Riley.
Fragaria sp.
frigidæ Oestl.
Artemisia frigida.
fulvæ Oestl.
Impatiens fulva.
pallida.
geranii Oestl.
Geranium maculata.
gerardiæ Thos.
Gerardiæ tenuifolia.
heucheræ Thos.
Heuchera hispida.
insularis Pergande.
(Host-plant unknown.)
lactucæ Kalt.
Lactuca sp.
Lettuce, cultivated.
lilii Monell.
Lilium sp.
liriodendri Monell.
Liriodendron tulipifera.
ludovicianus Oestl.
Artemesia ludoviciana.
menthæ Buckt.
Mentha canadensis.
Sarothammus scoparius.
minor Forbes.
Fragaria sp.
pallida Oestl.
Rosa sp.
perlagoni Kalt.
Geranium, cultivated, in greenhouse.
pisi Kalt.
Capsella bursa-pastoris.
Beet, cultivated.
Lathyrus odoratus.
Pea, cultivated.
Pisum sativum.
Spirea ulmaria.
Trifolium ripens.
Urtica gracilis.
dioica.

Genus MACROSIPHUM.
polygoni Walk.
Polygonum persicaria.
Polygonum sp.
potentillæ Oestl.
Potentilla anserina.
prunicola Ashm.
Plum, cultivated.
purpurascens Oestl.
Thalictrum purpurascens.
rosæ Linn.
Rosa sp.
rosæ, var. floridæ, Ashm.
Rosa sp.
rubi Kalt.
Blackberry, cultivated.
rudbeckiæ Fitch.
Ambrosia psylostachya.
trifidia.
Bidens chrysanthemoides.
Cacalia suavolens and tuberosa.
Circium arvenæ.
Cnicus sp.
Lactuca sp.
Mulgedium sp.
Rudbeckiæ laciniata.
Silphium perfoliatum.
integrefolium.
Solidago rigida.
serotina.
Sonchus oleraceus.
Vernonia fasiculata.
lindheimeri.
novoborascensis.
solanifolii Ashm.
Solanum jasminoides.
solidaginis Fabr.
Solidago canadensis.
seritona.
sonchella Monell.
Sonchus oleraceus.
tobaci pergande.
Tobacco.
thalcitri Oestl.
Thalicitrum purpurascens.
tenaceti Linn.
Tenacetum vulgare.
tiliæ Monell.
Tilia americana.
tulipæ Monell.
Tulip gesneriana.

Genus MACROSIPHUM.
- verbenæ Thos.
  - Verbena sp.
- viticola Thos.
  - Vitis cordifolia.
  - Grapevine, cultivated.

Genus MASTOPODA Oestl.
- pteridis Oestl.
  - Pteris aquilina.

Genus MEGOURA.
- solani Thos.
  - Wheat, cultivated.

Genus MONELLIA.
- caryella Fitch.
  - Carya amara.
    - alba.

Genus MYZUS Pass.
- achyrantes Monell.
  - Amarantus sp.
  - Corn.
  - Malva rotundifolia.
  - Beet.
  - Solanum melongena.
- cerasi Fabr.
  - Cherry, cultivated.
  - Plum, cultivated.
- mahaleb Fonsc.
  - Plum.
  - Asparagus.
- persicæ Sulz.
  - Peach, cultivated.
  - Plum, cultivated.
  - Cherry.
  - Nectarine.
- plantaginis Pass.
  - Plantago major.
- ribis Linn.
  - Ribis cynosbati.
    - viscossissimum.
    - aureum.
- rosarum Walker.
  - Rose, cultivated and wild.
  - Potentilla anserina, in greenhouse.

Genus NECTAROSIPHON.
- rubicola Oestl.
  - Rubus strigosus.

Genus PEMPHIGUS.
- aceris Monell.
  - Acer saccharium.

Genus PEMPHIGUS.

acerifolii Riley.
Acer saccharium.
alni Provancher.
Alnus Sp.
attenuatus Osborne-Sirrine.
Smilax rotundifoliæ.
betæ Doane.
Achillæa anulosa.
Polygonum aviculare.
Sugar beet.
burrowi n. sp.
Nasturtium sinuatum.
formicarius Walsh.
In nest of Formica aphidicola.
formicetorum.
fraxinifolii Riley.
Fraxinus americana.
sambucifolia.
quadrangulata.
imbricator Fitch.
Betula sp.
popularis Fitch.
Populus balsamifera.
populicaulis Fitch.
Populus tremuloides.
monilifera.
angulata.
populiconduplifolius Cowen.
Populus monilifera.
populiglobuli Fitch.
Populus balsamifera.
populimonilis Riley.
Populus balsamifera.
angustifolium.
populiramulorum Riley.
Populus balsamifera.
monilifera.
populitransversus Riley.
Populus balsamifera.
monilifera.
populivenæ Fitch.
Populus balsamifera.
pseudobyrsa Walsh.
Populus monilifera.
angulata.
rhois Fitch.
Rhus glabra.
rubi Thomas.
Rubus occidentalis.

Genus PEMPHIGUS.
stamineus Hald.
Acer dasycarpum.
tessalata Fitch.
Alnus rubra.
Betula papyraceæ.
Ash.
ulmifusus Walsh.
Ulma fulva.
vagabundus Walsh.
Populus monilifera.

Genus PHORODON Passerini.
humuli Schrank.
Prunus domesticus.
Humulus lupulus.
instiata.
spinosus.
scrophulariæ Thos.
Scropulariæ nodosa.

Genus PHYLLAPHIS Koch.
fagi Linn.
Fagus ferruginea.
niger Ashm.
Quercus phellos laurifoliæ.

Genus PHYLLOXERA Fonsc.
Caryæ Fitch.
Carya alba.
caryæavellana Riley.
Carya alba.
caryæcaulis Fitch.
Carya amara.
glabra.
caryæfallax Walsh.
Carya alba.
caryæglobuli Walsh.
Carya alba.
glabra.
caryægummosa Riley.
Carya alba.
caryæren Riley.
Carya glabra.
caryæscissa Riley.
Carya alba.
caryæsemen Walsh.
Carya glabra.
caryæsepta Shimer.
Carya glabra.
caryævenæ Fitch.
Carya alba.

Genus PHYLLOXERA Fonsc.
- castanæ Fitch.
  - Castanea sativa americana.
- conica Shimer.
  - Carya alba.
- depressa Shimer.
  - Carya sp.
- forcata Shimer.
  - Carya amara.
- gibbosa Shimer.
  - Carya glabra.
- minimum Shimer.
  - Carya amara.
- prolifera Oestl.
  - Pemphigus populicaulis galls.
- rileyi Licht.
  - Quercus alba.
    - bicolor.
    - obtusifolia.
- spinosa Shimer.
  - Carya amara.
- vastatrix Planchon.
  - Vitis cordifolia.

Genus RHOPALOSIPHUM Koch.
- ampullata Buckton.
  - Onoclea struthiopteris.
- berberidis Kalt.
  - Berberidis vulgaris.
- dianthi Schrank.
  - Asparagus officinalis.
  - Caladium eseulentum, in greenhouse.
  - Calla lily, in greenhouse.
  - Carnation pink, in greenhouse.
  - Catalpa, in greenhouse.
  - Corn, cultivated.
  - Crocus, garden, in greenhouse.
  - Cyranthus annuns, in greenhouse.
  - Gossypium herbaceum.
  - Hibiscus, in greenhouse.
  - Herera helix.
  - German ivy.
  - Iris pumila, in greenhouse.
  - Lactuca scariola.
  - Lilium sp., in greenhouse.
  - Maurandia hendersoni, in greenhouse.
  - Nicotina sp.
  - Oxalis, cultivated, in greenhouse.
  - Polianthus tuberosa, in greenhouse.
  - Robina pseudocacia.
  - Sonchus oleraceus.

Genus RHOPALOSIPHUM Koch.
- dianthi Schrank.
  - Townsendria senicea.
  - Tulip gesneriana, in greenhouse.
- nabali Oestl.
  - Nabalus albus.
- nymphææ Linn.
  - Alisma plantago.
  - Bidens chrysanthemoides.
  - Juncus.
  - Lemna minor.
    - polyrrhiza.
  - Naias flexillus.
  - Nelumbo lutea.
  - Potamogeton.
  - Sagittaria variabilis.
- rhois Monell.
  - Rhus glabra.
- serotinæ Oestl.
  - Pyrus malus.
  - Solidago serotina.
    - rigida.
- solani Thos.
  - Tomato, cultivated.
- tulipæ Thos.
  - Tulip gesneriana.
- violæ Pergande.
  - Violets, especially in greenhouses.

Genus SCHIZONEURA Hartig.
- americana Riley.
  - Ulmus americana.
- caryæ Fitch.
  - Percatus.
  - Carya sp.
  - Juglans nigra.
- corni Fabr.
  - Andropogan furcatus.
  - Capsella bursa pastoris.
  - Cornus florida.
    - stolonifera.
    - asperifolia.
    - sanguinea.
    - sericea.
  - Eragrostis major.
    - pectinacea spectabilis.
  - Grindelia squarrosa, on roots.
  - Muhlenbergia racemosa.
  - Panicum capillare.
    - crus galli.
    - sanguinale.

Genus SCHIZONEURA Hartig.
Panicum capillare.
proliferum.
glabrum.
Plum, cultivated.
Polygonum aviculare.
Setaria glauca.
viridis, on roots.
italica, on roots.
Spartina cynosuroides.
cratægi Oestl.
Cratægus coccinea.
punctata.
tomentosa.
lanigera Hausm.
Pyrus mali.
coronaria.
pinicola Thos.
Pinus strobus.
ponderosa var. scopulorum.
querci Fitch.
Quercus macrocarpa.
undulata.
rileyi Thos.
Ulmus americana.
Genus SIPHA Passerini.
rubifolii Thos.
Blackberry, cultivated.
Genus SIPHOCORYNE Passerini.
archangelicæ Oestl.
Archangelica atropupurea.
salicis Monell.
Salix babylonica.
lucida.
nigra.
xanthi Oestl.
Xanthium-canadense.

NOTE.—The Host lists contained herein are compilations including personal field observations. Many synonyms are known to be included in these lists, but it is almost impossible to verify all these at this period of my investigation.

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